

REMARKS

Reconsideration and allowance of the above-referenced application are respectfully requested. The foregoing amendments are responsive to the January 30, 2002 Office Action. Applicants respectfully request entry of the requested amendments and reconsideration of the application in view of the following comments.

Amendment to the Title

The title has been amended herein to better describe the invention. Applicant respectfully requests entry and approval of the new title.

Response to the Claim Objections

Claim 15 is objected to as being unclear. Claim 15 is amended herein to have a limitation of flowable at 450°C.

Response to objections under 35 U.S.C. § 112, second paragraph

Claims 1-14 and 20-27 stand rejected under 35 U.S.C. § 112, second paragraph as containing subject matter not described in the specification. The rejection alleges that there is no support in the specification for an element which

belongs to groups 12 to 15 existing at a higher concentration at a boundary than in other regions. The claims are amended to eliminate this limitation and Applicants respectfully submit that all claims now comply with the requirements of 35 U.S.C. § 112.

Response to the Claim Rejections Under 35 U.S.C § 103

Claims 9-10, 12-13, and 15-18 are rejected under 35 U.S.C. § 102(e) as being unpatentable over U.S. Patent No. 5,283,206 issued to Sugano. The rejection asserts that Sugano allegedly teaches each element of the claims except for an element at a boundary having a higher concentration than in other regions, which is allegedly obvious to one of skill in the art. Claims 1-8, 11, 14, and 19-27 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Sugano in view of the admitted prior art (APA). The rejection asserts that Sugano allegedly teaches each element of the claims except for an insulating film formed on the conductive layer, which is allegedly taught by the APA.

The claims are directed toward a semiconductor device having at least one thin film transistor over a substrate. In particular, the thin film transistor comprises a conductive layer comprising aluminum, an insulating film formed on the conductive layer, a contact hole formed through the insulating

film, a wiring electrically connected with the conductive layer in the contact hole, and an alloy comprising at least one selected from the group consisting of Ge, Sn, Ga, Zn, Pb, In, and Sb exisiting at least *in the contact hole and at a boundary between the conductive layer and the wiring* and/or a vicinity thereof. This structure allows a reliable contact between the conductive layer and the wiring.

None of the cited art teaches or suggests an alloy comprising at least one selected from the group consisting of Ge, Sn, Ga, Zn, Pb, In, and Sb exisiting at least *in the contact hole and at a boundary between the conductive layer and the wiring*. Each of the independent claims are amended herein to require this element, as supported by reference numeral 320 of Figure 3C and the second paragraph of page 24 of the specification. Neither Sugano nor the APA teach that the alloy exists in the contact hole and at a boundary between the conductive layer and the wiring.

In view of the foregoing distinctions, Applicants respectfully submit that independent Claims 1, 5, 9, 12, 15, 20, and 24 are patentably distinguished over the cited art. Applicants respectfully submit that Claims 1, 5, 9, 12, 15, 20, and 24 are in condition for allowance, and Applicants respectfully request allowance of Claims 1, 5, 9, 12, 15, 20, and 24.

Claims 2, 4, 6, 8, 11, 13-14, 19, 21, 23, 25, and 27 depend either directly or indirectly from one of the independent claims. Each dependent claim further defines the independent claim from which it depends. In view of the foregoing remarks regarding Claims 1, 5, 9, 12, 15, 20, and 24, Applicants respectfully submit that Claims 2, 4, 6, 8, 11, 13-14, 19, 21, 23, 25, and 27 are likewise in condition for allowance. Applicants respectfully request allowance of dependent Claims 2, 4, 6, 8, 11, 13-14, 19, 21, 23, 25, and 27.


Summary

In view of the above amendments and remarks, all of the claims should be in condition for allowance. A formal notice to that effect is respectfully solicited.

Enclosed is a \$110 check for the Petition for
Extension of Time fee. Please apply any other charges or
credits to Deposit Account No. 06-1050.

Respectfully submitted,

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Version with markings to show changes made

In the claims:

Claims 3, 7, 10, 13, 16-18, 22, and 26 have been cancelled.

Claims 1, 5, 9, 12, 15, 20, and 24 have been amended as follows:

1. (Amended) A semiconductor device comprising at least one thin film transistor over a substrate, said thin film transistor comprising:

a conductive layer comprising aluminum;
an insulating film formed on said conductive layer;
a contact hole formed through said insulating film;
a wiring [being in contact] electrically connected with said conductive layer in said contact hole; and

an [element which belongs to groups 12 to 15] alloy comprising at least one selected from the group consisting of Ge, Sn, Ga, Zn, Pb, In, and Sb existing at least in said contact hole and at a boundary between said conductive layer and said wiring and a vicinity thereof [at a higher concentration than in other regions].

5. (Amended) A semiconductor device comprising at least one thin film transistor over a substrate, said thin film transistor comprising:

a conductive layer comprising aluminum;
an insulating film formed on said conductive layer;
a contact hole formed through said insulating film;
a wiring [being in contact] electrically connected with said conductive layer in said contact hole; and

an [element which belongs to groups 12 to 15] alloy comprising at least one selected from the group consisting of

Ge, Sn, Ga, Zn, Pb, In, and Sb existing at least in said contact hole and at a boundary between said conductive layer and said wiring or a vicinity thereof [at a higher concentration than in other regions].

9. (Amended) A semiconductor device comprising at least one thin film transistor over a substrate, said thin film transistor comprising:

two conductive films comprising aluminum [being in contact] electrically connected with each other in a contact hole opened in an insulating film; and

an [element which belongs to groups 12 to 15] alloy comprising at least one selected from the group consisting of Ge, Sn, Ga, Zn, Pb, In, and Sb existing at least in said contact hole and at a boundary between said two conductive films and a vicinity thereof [at a higher concentration than in other regions].

12. (Amended) A semiconductor device comprising at least one thin film transistor over a substrate, said thin film transistor comprising:

two conductive films comprising aluminum [being in contact] electrically connected with each other in a contact hole opened in an insulating film; and

an [element which belongs to groups 12 to 15] alloy comprising at least one selected from the group consisting of Ge, Sn, Ga, Zn, Pb, In, and Sb existing at least in said contact hole and at a boundary between said two conductive films or a vicinity thereof [at a higher concentration than in other regions].

15. (Amended) [An insulated-gate field-effect] A semiconductor device comprising at least one thin film transistor over a substrate, said thin film transistor comprising:

a wiring electrode comprising aluminum which is electrically connected to at least a part of said semiconductor device through a contact hole formed through an interlayer insulating film; and

an [element] alloy comprising at least one selected from the group consisting of Ge, Sn, Ga, Zn, Pb, In, and Sb contained in the wiring electrode and existing at least in said contact hole and at a boundary between said wiring electrode and the part of said semiconductor device which [element] one renders the wiring electrode flowable at 450 [C] °C or less.

20. (Amended) A semiconductor device comprising:

at least one thin film transistor formed over a substrate, said thin film transistor comprising at least a semiconductor region, a gate electrode, and a gate insulating film interposed therebetween;

an interlayer insulating film formed over said thin film transistor;

a contact hole formed through said interlayer insulating film;

a wiring [being in contact] electrically connected with said semiconductor region in said contact hole; and

an [element which belongs to groups 12 to 15] alloy comprising at least one selected from the group consisting of Ge, Sn, Ga, Zn, Pb, In, and Sb existing at least in said contact hole and at a boundary between said semiconductor region and

said wiring and a vicinity thereof [at a higher concentration than in other regions].

24. (Amended) A semiconductor device comprising:

at least one thin film transistor formed over a substrate, said thin film transistor comprising at least a semiconductor region, a gate electrode, and a gate insulating film interposed therebetween;

an interlayer insulating film formed over said thin film transistor;

a contact hole formed through said interlayer insulating film;

a wiring [being in contact] electrically connected with said semiconductor region in said contact hole; and

an [element which belongs to groups 12 to 15] alloy comprising at least one selected from the group consisting of Ge, Sn, Ga, Zn, Pb, In, and Sb existing at least in said contact hole and at a boundary between said semiconductor region and said wiring or a vicinity thereof [at a higher concentration than in other regions].